[Total No. of Questions - 8] [Total No. of Printed Pages - 3] (2125)

15391

M. Tech 1st Semester Examination

Power System Operation and Control (NS)

EE1-511

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : This question paper carries eight questions. Attempt any five questions. All questions carry equal marks.

1. (a) Discuss characteristics of steam generation units and suggest methods for improving unit efficiency and reliability of the steam plant. (8)

   (b) With a neat flow chart explain the Newton's algorithm for solving the economic dispatch of N-bus power system taking into account the effects of system losses. (12)

2. (a) Explain the significance of equality and inequality constraints in the economic allocation of generation among different plants in a system. (5)

   (b) Explain the importance and functions of economic load dispatch controller. (5)

   (c) Explain transmission effects and issues in deregulated power system. (5)

   (d) Two generators rated 250MW and 500 MW are operating in parallel. The droop characteristics are 4 percent and 6 percent respectively. Assuming that the generators are operating at 50 Hz at no load, how would a load of 750MW be shared? What is the system frequency? Assume free governor action. (5)

[P.T.O.]

3. What is Automatic Voltage Control (AVC) and Load Frequency Control (LFC) in an integrated power system? Show a schematic diagram of AVC and LFC for a synchronous generator in details. How AVC-dynamics does not affect LFC dynamics? Explain. (20)

4. Write short notes on:

   (a) Power pools.

   (b) Inter utility economy energy evaluation. (20)

5. (a) Discuss briefly various constraints imposed while solving unit commitment problem. Discuss the importance of spinning reserve requirements in the solution of unit commitment problem. Discuss briefly the cold start up cost and banking cost when referred to a thermal plant. (10)

   (b) Explain concept of power flow and explain gradient method to obtain optimal solution for power flow. (Inequality contains) (10)

6. (a) A two plant system that has a hydro plant near the load centre and a steam plant at a remote location. The load is 400MW for 14 hr a day and 200MW for 10 hr a day. The characteristics of the units are

   $C_1=150+160P_{GT}+0.1P_{GT}^2$ Rs. /hr.

   $W_2= 0.8\ P_{GH}+0.000333\ P_{GH}^2\ m^3/s.$

   Loss-coefficient $B_{22}=0.001$/MW.

   Find the generation schedule, daily water used by the hydro plant and the daily operating cost of a thermal plant for $r_j=77.5$ Rs./m^3hr. (15)

(b) A 500MW generator has a speed regulation of 4%. If the frequency drops by 0.12 Hz with an unchanged reference, determine the increase in turbine power. Also Find by how much the reference power setting should be changed if the turbine power remains unchanged. (5)

7. (a) The fuel cost for the three units are given here under

Fuel cost (1)=Rs. 1.0/MBtu, Fuel cost (2)=Rs.1.1/MBtu,

Fuel cost (3)=Rs.1.2/MBtu,

Unit 1: Min 160 MW Max 600 MW

$F_1=600+7.1P_1+0.00141P_1^2$

Unit 2: Min 100 MW Max 450 MW

$F_2=300+7.80P_2+0.00195P_2^2$

Unit 3: Min 50 MW Max 250 MW

$F_3=80+8.0P_3+0.0049P_3^2$

The load on the system is 500 MW, assuming the start up cost, minimum up/down costs to be negligible. What unit or combination of units should be used to supply this load most economically with Dynamic programming method? (12)

(b) Explain long term co-ordination and short term co-ordination for hydro and thermal plants. (8)

8. (a) What is meant by cogeneration? What are the reasons for promoting cogeneration in decentralised environment? Discuss. (7)

(b) Derive the line model for interconnected areas. (7)

(c) Explain the phenomenon called 'Wheeling' in context with multiple - utility interchange transactions. (6)